Remarks:

Disposition of Claims

Examiner rejected claims 1-41, and objected to 11, 16, 29-31, and 34. Applicants acknowledge the Examiner's indication that claims 11, 16, 29-31, and 34, would be allowed if rewritten in independent form. Applicants believe that all the claims as originally drafted and currently amended are in allowable form. Claims 1-34 are presented for examination.

Rejections under 35 U.S.C. §§ 102, 103

Independent Claim 1

The Examiner rejected independent claim 1 as anticipated under 35 U.S.C. 102(b) by Kusunoki (U.S. 2004/0207671). Applicants respectfully submit that Kusunoki fails to disclose applying a multipulse waveform…wherein a frequency of the drive pulses is greater than a natural frequency of the droplet ejection device, as recited in independent claim 1. There seems to be an error in Kusunoki. The specification uses symbol, T_s, in conjunction with resonance period consistent with conventional practice, but later in the specification, Kusunoki describes T_s as the resonance frequency. (See para. 0119 and 0120, resonance period T_s; para. 0126 and 0130 resonance frequency T_s) It appears that this is a typographical error and that T_s represents the resonance period.

We submit therefore that Kusunoki still does not disclose a frequency of the drive pulses greater than a natural frequency, *fi*, of the droplet ejection device. The Examiner cites paragraphs 0126-0130 and FIGS. 13 and 14 as disclosing, a frequency of the drive pulses greater than a natural frequency, *fi*, of the droplet ejection device. First, Kusunoki discloses that the falling time constant t_f is set to be greater than the resonance frequency T_s, and another case is that the falling time constant t_f is set to be no greater than the resonance frequency T_s. (para. 0126) The falling time constant t_f, however, is not the same as the frequency of the drive pulses. Even if the falling time constant is greater than the resonance frequency, this does not mean that the frequency of Kusunoki's drive pulses is greater than the natural frequency.

Second, Kusunoki provides the following equation:

$$P_w+t_f=(n+1/4)xT_s$$

where P_w is the pulse width, t_f is the falling time constant, n is an integer that is no less than 1, and T_s is the resonance frequency. (para. 0127-0128) Assuming that T_s does refer to the resonant frequency, the pulse width P_w plus the falling time constant t_f are greater than the resonant frequency T_s because n is an integer not less than 1. However, the sum of pulse width P_w and falling time constant t_f is not the same as the frequency of the drive pulses.

Accordingly, Kusunoki does not anticipate claim 1 because Kusunoki does not disclose a frequency of the drive pulses is greater than a natural frequency. Applicants respectfully request that the rejection be withdrawn. Furthermore, because claims 2-17 depend from claim 1, these dependent claims are not anticipated for at least the same reason that independent claim 1 is not anticipated.

Independent Claim 28

The Examiner rejected claim 28 as anticipated under 35 U.S.C. 102(b) by Kusunoki. Kusunoki fails to disclose a droplet ejection device, wherein a plurality of drive pulses has a frequency greater than the natural frequency f_j. As stated with reference to claim 1, Kusunoki describes a falling time constant or a pulse width plus the falling time constant can be greater than the resonance frequency T_s. This is not the same as the frequency of a plurality of drive pulses being greater than the natural frequency f_j.

Accordingly, Applicants respectfully request that the rejection under 35 U.S.C. 102(b) be withdrawn. Furthermore, because claims 29-34 depend from claim 28, these dependent claims are not anticipated for at least the same reason that independent claim 28 is not anticipated.

Independent Claim 18

The Examiner rejected independent claim 18 as obvious under 35 U.S.C 103(a) over Oikawa (U.S. 2002/0039117) in view of Bibl (U.S. 7,052,117). Oikawa describes applying double pulses to an electrothermal transducer having a pulse width between 1.6 and 3.6 microseconds. (para. 0094; FIGS. 12 and 13) The Examiner acknowledges that Oikawa fails to disclose a piezoelectric droplet ejection device as recited in independent claim 18, and cites Bibl

as disclosing this feature. Applicants respectfully submit that the Examiner has failed to show a *prima facie* case of obviousness. "To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings" [MPEP, §2143]. Second, to establish a case of *prima facie* obviousness, "there must be a reasonable expectation of success". Third, "the prior art reference (or references when combined) must teach or suggest all the claim limitations" [MPEP, §2143].

The Examiner has not provided sufficient motivation to combine Oikawa and Bibl to arrive at the claimed invention, "[a] method comprising driving a piezoelectric droplet ejection with a waveform comprising one or more pulses having a period less than about 20 microseconds...." The Examiner says that it would have been obvious at the time of the invention to a person having ordinary skill in the art to utilize a piezoelectric droplet device as taught by Bibl into Oikawa for the purpose of providing ejection device for ink droplets. Simply because the references are analogous art (ink ejection devices) does not mean that a person of ordinary skill in the art would be motivated to combine the two references.

To the contrary, a person of ordinary skill in the art would not be motivated to combine Oikawa's method of using an electrothermal transducer with Bibl's piezoelectric element because of the different characteristics of electrothermal and piezoelectric transducers. Oikawa describes the problems faced when the number of nozzles is increased to achieve faster printing and higher resolution. Increasing the nozzles means increasing the number of heaters that need to be driven simultaneously and thus an instantaneous maximum current also increases, further increasing the drop in the power supply voltage due to wiring electrodes. (paragraph 0010) To solve this problem, Oikawa provides an ink jet printing method, which controls a pulse width based on heater resistance, wiring resistance, and the voltage drop caused by simultaneous driving of a plurality of heaters. (paragraph 0020) On the other hand, a piezoelectric element is not concerned with heater resistance or the voltage drop caused by simultaneous driving of a plurality of heaters. Thus, a person of ordinary skill in the art would not be motivated to combine Oikawa's pulse width timings, which are based on electrothermal characteristics, with Bibl's piezoelectric element to arrive at the claimed invention.

Further, it appears the rejection has impermissibly used hindsight in an attempt to reconstruct the applicant's invention. It is improper to use the applicant's disclosure as the motivation to combine the particular teachings in the cited references: "The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in Applicant's disclosure". See, M.P.E.P. 2143, citing *In re Vaeck*, 947 F.2d 488 (Fed. Cir. 1991).

It is respectfully submitted that merely because prior art can be modified is not sufficient to render a claim *prima facie* obvious. See M.P.E.P. § 2143.01, which sets forth the applicable standard:

> The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. (*In re Mills*, 16 USPQ2d 1430 (Fed. Cir. 1990)).

Accordingly, Applicants respectfully request that the rejection under 35 U.S.C. 103(a) be withdrawn. Furthermore, because claims 19 and 20 depend from claim 18, these dependent claims are not anticipated for at least the same reason that independent claim 18 is not anticipated.

Independent Claim 21

The Examiner also rejected independent claim 21 as obvious under 35 U.S.C 103(a) over Oikawa in view of Bibl. The Examiner acknowledges that Oikawa fails to disclose a piezoelectric droplet ejection device as recited in independent claim 21, and cites Bibl as disclosing this feature. Similar to claim 18, there is no motivation to combine Oikawa's method of using an electrothermal transducer with Bibl's piezoelectric element to arrive at the claimed invention.

Accordingly, Applicants respectfully request that the rejection under 35 U.S.C. 103(a) be withdrawn. Furthermore, because claims 22-26 depend from claim 21, these dependent claims are not anticipated for at least the same reason that independent claim 21 is not anticipated.

The Examiner also rejected dependent claim 27 as being unpatentable under 35 U.S.C. 103(a) over Oikawa. The Examiner acknowledges that Oikawa fails to disclose the droplet has a mass between 50 picoliters and 1000 picoliters. The Examiner states that discovering optimum or workable ranges involves routine skill in the art. The Examiner states that since Oikawa discloses a 42 ng droplet mass, it would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize a droplet mass between 50 picoliters and 1000 picoliters. Applicants submit that a person of ordinary skill in the art would not be motivated to combine Oikawa and Bibl to provide the invention of independent claim 21, a method of driving a piezoelectric droplet ejection device with a waveform comprising one or more pulses each having a period of less than about 20 microseconds. Since claim 27 depends from independent claim 21, claim 27 is not obvious for at least the same reason as claim 21.

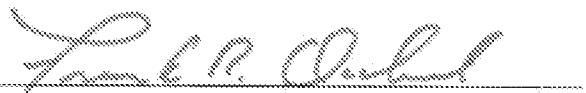
Accordingly, Applicants respectfully request that rejection of claim 27 under 35 U.S.C. 103(a) be withdrawn.

Conclusion

Please apply any charges, not covered, or credits to deposit account 06-1050.

Respectfully submitted,

Date: January 19, 2007



Frank R. Occhiuti
Reg. No. 35,306

Fish & Richardson P.C.
225 Franklin Street
Boston, MA 02110-2804
Telephone: (617) 524-5070
Facsimile: (617) 542-8906